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Evaluation of Some Serum Biochemical Indices in Patients with Gestational Diabetes

Marwa A. Hadi and Nawal H. Al-Hashimi*

Department of Medical Instrumentations Technologies, Al Salam University College, Baghdad, Iraq

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Abstract

The aim of this study was to evaluate some serum biochemical indices in patients with gestational diabetes. Among the study's participants were 100 expectant mothers ranging in age from 24 to 35 who had been diagnosed with diabetes at a maternity hospital or pregnancy center in Baghdad city. According to their previous menstrual cycle or an ultrasound, these ladies were between 28 and 33 weeks pregnant. There were two categories of pregnant women: Twenty pregnant women in good health comprised (control group). Eighty GDM-pregnant women were enrolled. The current results showed a significant increase in levels of glucose, cholesterol, triglyceride, ALT, bilirubin, uric acid, and creatinine in the GDM group as compared with control patients, also a significant decrease in the levels of Albumin, HDL in GDM group as compared with control group. There were no significant differences in the levels of urea and AST in both GDM and control groups. In conclusion, there was a significant increase in levels of glucose, cholesterol, triglyceride, ALT, bilirubin, uric acid, and creatinine in the GDM group.

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*Corresponding author: nnawalhaider94@gmail.com

1. Introduction

Hyperglycemia caused by insulin production, insulin action, or both characterizes the group of diseases known as diabetes mellitus [1]. Diabetes is classified into several types based on its etiology, including type 1, type 2, gestational diabetes (GDM), and a number of other variants [2]. A disease of carbohydrate intolerance known as gestational diabetes may have varying degrees of severity during the first trimester [3] and it's also possible that oxidative stress and a compromised antioxidant system are to blame for anti-terrorist measures [4].

The GDM occurs in 3% - 5% of all pregnancies, with severity varying, and may be linked to oxidative stress, antioxidant defenses are also compromised [4]. Overproduction of oxidizing molecules causes the gradual deterioration of the oxidative capacity of tissues, and depletion of insulin in the pancreas because of pancreatic β cells [5]. In addition, antioxidants include bilirubin and uric acid, as well as all forms of total protein, in disorders associated with oxidative stress [6,7], and torment [8,9].

Carbohydrate, lipid, and amino acid metabolisms are all significantly altered during a healthy pregnancy [10]. During the final trimester of gestational diabetes and type 2 diabetes during pregnancy, we compared the changes in blood lipids with those in normal pregnancies. Diabetic dyslipidemia, defined by elevated triglycerides (TGL) and normal or slightly elevated levels of LDL cholesterol and total cholesterol in the blood, is one kind of lipid abnormality [11]. Cholesterol, TGL, phospholipids, and free fatty acids are all elevated in pregnant women's bloodstream. Increases in hepatic synthesis and decreased clearance caused by placental hormones result in a four-fold increase in fasting TGL concentration during pregnancy [12,13]. Pregnancy-induced hyper-triglyceridemia may also be caused by maternal lipoprotein lipase activity. When progesterone stimulates hepatic lipase, the HDL-cholesterol content in the blood rises.

The aim of this study was to evaluate some serum biochemical indices in patients with gestational diabetes.

2. Materials and Methods

Among the study's participants were 100 expectant mothers ranging in age from 24 to 35 who had been diagnosed with diabetes at a maternity hospital or pregnancy center in Baghdad city. According to their previous menstrual cycle or an ultrasound, these ladies were between 28 and 33 weeks pregnant. There were two categories of pregnant women: Twenty pregnant women in good health comprised the first group (G1)

(control group). Eighty GDM-pregnant women were enrolled in the second group (G2).

Five milliliters of fasting blood were taken from each subject and centrifuged to separate the serum, which was then placed in a plain tube with no anticoagulant and kept in an icebox until it could be transported to a laboratory to be tested for glucose levels, HDL, Cholesterol, ALT, AST, bilirubin, Albumin, uric acid, Urea, and creatinine. EL200 ELitech group was used to measure all biochemical parameters [14].

3. Statistical Analysis

Data analysis was performed using SPSS statistical program (version 23). Analysis of variance (ANOVA) was used to determine whether there are any statistically significant differences between the means.

4. Results and Discussion

The current results showed a significant increase in levels of glucose, cholesterol, triglyceride, ALT, bilirubin, uric acid, and creatinine in the GDM group as compared with control patients, also there was a significant decrease in the levels of Albumin, and HDL in the GDM group as compared with the control group. There were no significant differences in the levels of urea and AST in both the GDM and control groups (Table 1).

Table 1. Biochemical parameters in control and GDM groups.

Parameter	Control group Mean ± SD	GDM group Mean ± SD	P-value
Glucose	89.65 ± 3.7	153.2 ± 12.3	0.001***
Cholesterol	180.2 ± 15.8	196 ± 13.2	0.01**
HDL	47.3 ± 1.4	41.5 ± 2.8	0.05*
Triglyceride	150.6 ± 3.2	187.9 ± 6.6	0.01**
ALT	28.4 ± 0.7	38.1 ± 0.3	0.01**
AST	27.3 ± 0.6	28.2 ± 0.7	0.21 (N.S)
Bilirubin	0.7 ± 0.02	0.9 ± 0.01	0.01**
Albumin	5.8 ± 0.04	3.1 ± 0.01	0.01**
Uric acid	2.8 ± 0.01	3.9 ± 0.02	0.05*
Urea	20.1 ± 0.3	20.7 ± 0.1	0.31 (N.S)
Creatinine	0.8 ± 0.002	1.3 ± 0.001	0.01**

Gestational Diabetes; (GDM), SD; Standard deviation, HDL; High-density lipoprotein, ALT; Alanine aminotransferase, AST; aspartate aminotransferase, $^{*}P \leq 0.05$, $^{**}P \leq 0.01$, $^{***}P \leq 0.001$.

Maternal and fetal problems are common in women with gestational diabetes mellitus (GDM) or type 2 diabetes mellitus (DM2). In recent research on animals, diabetic pregnancy-related fetal malformations have been linked to an intrauterine metabolic environment. The consequences of maternal diabetes on lipid metabolism remain unknown [15] because of the changes in metabolic fuels that diabetes causes in the mother and the high incidence of problems associated with diabetic pregnancy. Many studies have investigated the alterations in lipid and lipoprotein levels in diabetes pregnancies [16-17].

It has been reported that GDM's blood glucose levels were substantially greater than those of G1 (p 0.001). Diabetes severely impacts liver and kidney function tests [18]. A rise in triglycerides and a decrease in cholesterol are the main symptoms of hyperlipidemia, which is typical in healthy pregnancies [19,20]. Pregnant women with gestational diabetes (GDM) were found to have higher levels of total cholesterol than their non-diabetic counterparts. According to Schaefer-Graf et al. [21], serum triglyceride levels in pregnant women with gestational diabetes mellitus have recently been linked to aberrant fetal development. When compared to group 1, the total blood cholesterol levels in groups 2 and 3 were significantly higher in our research. Pregnant women's LDL-cholesterol and VLDL-cholesterol levels tend to rise as well. Hollingsworth [22] 1982 documented alterations in LDL-cholesterol levels in GDM patients that did not occur during pregnancy. When compared to a healthy pregnancy, this study found no significant increase in LDL or VLDL cholesterol in GDM patients [20]. In comparison to normal pregnancies, Montelonge [19] found a substantial rise in LDL-cholesterol in GDM groups.

Like Tarim et al., we found greater levels of creatinine in patients with GDM. Even while they didn't find a correlation that was statistically significant [23-24], we did find a connection that was statistically significant. GDM is thought to be caused by lipid peroxidation, which has a significant impact on the disease. Studies in animals show a link between GDM problems and high amounts of oxygen-derived free radicals, which may be avoided by antioxidants [25-26]. Oxidative stress and a reduction in the body's antioxidant defenses are both exacerbated by high blood glucose levels, which in turn increase the generation of free radicals.

Serum uric acid levels were found to be substantially higher in GDM women than in the controls in this research (P0.05). Because of its antioxidant characteristics, uric acid may be useful in combating free radical damage. All insulin

resistance disorders are characterized by elevated levels of blood uric acid [27].

Insulin, on the other hand, has an impact on uric acid levels in the bloodstream. It works by reducing uric acid excretion via the renal tubules. In addition to reducing renal excretion, insulin may also promote renal uric acid reabsorption. Despite the presence of insulin resistance in GDM, insulin's actions on renal tubules remain. Conclusions drawn from this study are as follows [27]; It can be inferred that hyperuricemia found in GDM may be induced by insulin's actions on kidneys despite insulin resistance. When adenosine breaks down in the body, uric acid is the end product, and it plays a crucial part in insulin resistance's pathogenesis [29].

An increase in renal uric acid retention due to adenosine alone has been shown in several studies. There have been few studies in the past that have tested uric acid levels in GDM or shown that these women had substantially higher blood uric acid levels. In contrast to the controls, GDM women had significantly higher blood uric acid levels in our research [30].

Because blood albumin levels show the liver's ability to synthesize protein, a drop-in albumin levels in GDM patients suggests that their livers may be malfunctioning. A rise in protein excretion from the kidneys in GDM may accompany the reduction in protein synthesis. Because of the increased permeability of the glomerular basement membrane [31] to proteins and the reduced renal tubular reabsorption of proteins, protein excretion has risen. On the other hand, low albumin levels in these women may be caused by microalbuminuria, which is a common complication of insulin resistance syndromes [32-33].

The presence of microalbuminuria in GDM women is a signal of renal illness in the future, hence continuous monitoring of these women for additional kidney disease indicators has been recommended [34].

Several liver enzymes, including gamma-glutamyl transferase (GGT), ALT, and AST, have been linked to T2DM in previous research [35]. Nonetheless, the link between GDM and a variety of liver enzymes remained disputed. In most prior investigations, GGT and ALT were shown to be risk factors, but AST was found to be unrelated to GDM. In a recent meta-analysis [36], only GGT was shown to have a significant favorable correlation with GDM. The ALT/AST was initially believed to be an indicator of viral hepatitis, but it has since been linked to metabolic disorders as well. ALT/AST, rather than a single liver enzyme, was able to follow changes in insulin sensitivity and -cell function in 336 postpartum women with diverse degrees of past prenatal glucose metabolic status at 1 and 3 years postpartum, according to research by Pinnaduwage et al. [37]. Maintaining glucose homeostasis is dependent on the liver's ability to regulate many metabolic processes, including glycogenesis, glycogenolysis, glycolysis, and gluconeogenesis [38]. The ALT and AST both have a high positive link with the buildup of fat in the liver, which may be affected by liver disease [39-40].

5. Conclusion

A significant increase in levels of glucose, cholesterol, triglyceride, ALT, bilirubin, uric acid, and creatinine in the GDM group.

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Conflicts of Interest

An according to the authors, a conflict of interest is not present.

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